ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band, to Reallocate the 29.5 - 30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services	)	CC Docket No. 92-297
and	)	
Suite 12 Group Petition for Pioneer's Preference	)	PP-22

Comments of Texas Instruments
on the
Third NPRM and Supplemental Tentative Decision

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SUMMARY

Texas Instruments Incorporated supports the rapid resolution of the 28 GHz issues to allow the many planned LMDS and Satellite services to proceed. The Commission is to be commended for development of a band plan that can serve the various proposed services, resolve technical compatibility problems, and provide the basis for the early introduction of LMDS and satellite services. This proposed rule making will allow LMDS and satellite companies to deploy broadband systems in the 28 GHz band to help fulfill the United States' vision for a National and Global Information Infrastructure (NII/GII). Texas Instruments supports the proposed band segmentation plan where LMDS is the primary service in the 27.5 - 28.35 GHz, (850 MHz), segment and co-primary with the MSS Feeder Links in the 29.1 - 29.25 GHz, (150 MHz), segment provided that the basis of co-primary operation of the LMDS hubs and subscriber links can be developed with the MSS feeder links.

Texas Instruments is convinced that both LMDS and MSS feeder links can co-share the 29.1 - 29.25 GHz frequency spectrum if the applicants cooperate fully, design their systems for sharing and operate them in a manner to minimize potential interference. This 150 MHz of non-contiguous spectrum is key to the development of low cost subscriber equipment, (CPEs) with inbound return transmissions to the hubs. The LMDS systems and the MSS feeder links are able to coordinate their installations and location such that the co-sharing of the frequency in the 150 MHz segment can be achieved. Analysis accomplished during the 1994 28 GHz Negotiated Rule Making Committee (NRMC) indicated the LMDS hubs and CPEs as an aggregate can be operated in such a

manner to not interfere with MSS feeder links and their respective satellites. Texas Instruments believes that this sharing is even more important under the current FCC band plan since the new plan contemplates only half of the spectrum originally proposed for LMDS. If sharing is not accomplished in the 29.1 to 29.25 GHz segment where CPEs are able to operate with return link transmission, the current band plan would be far short of originally proposed frequency allocation for LMDS. The technical analysis, provided in Appendix A, shows that the power spectrum density of the LMDS CPEs will not cause harmful interference to MSS feeder link satellite receivers. Also, the MSS feeder links and the LMDS systems can be located and operated such that the MSS feeder links will not cause interference to the LMDS hub receivers. Operation of the MSS feeder stations at higher antenna elevation angles, (7 or 8 degrees or higher; i.e., 10 degrees at the United States latitudes) will minimize the power radiated in the direction of the LMDS systems, promote interference reduction and sharing of the spectrum.

Texas Instruments agrees that standards should be adopted to facilitate coordination between geographically adjacent LMDS systems and between LMDS and MSS feeder link facilities where they share spectrum. The same parameters that enable CPEs to transmit in the 29.1 - 29.25 GHz in a frequency co-share manner with the MSS feeder links also applies to adjacent LMDS systems. To specify that LMDS operators employ only orthogonal polarized signals such as vertical and horizontal may be necessary to have polarization available for coordination between different LMDS systems. An analysis that makes use of polarization and site/spacing characteristics is provided in Appendix B. Vertical and horizontal polarization does not appear to offer greater spectrum sharing capability with satellite systems since these systems make use of circular

polarized antennas. The orthogonal polarized LMDS signals and the MSS feeder link circular polarized signals would offer a 3 dB advantage due to the difference in the signal polarizations.

The transmitter EIRP is specified and measured on a dBW/Hz basis. The Texas Instruments digital system and FM analog systems would have a measurement issue if EIRP were specified using these units, dBW/Hz. We recommend that the specification be in terms of dBW/MHz to accommodate those cases where the LMDS system makes use of a reference signal, (as used in the Texas Instruments system), or to accommodate the J_0 Bessel component term of an FM system. The TI hub pilot carrier transmit EIRP level is +5.0 dBW and would be acceptable with 3 dB margin if measured on a dBW/MHz basis but since this is a single carrier it would not meet the proposed -52 dBW/Hz level when measured on a 1 Hz bandwidth basis. Thus, it is recommended that the EIRP power density for LMDS hubs be specified to be consistent with the intent of this requirement to minimize interference.

The subscriber terminal transmitter power is typically 100 mW or less with active power control, and with 34 dB antenna gain the EIRP is 24 dBW with a 2.5 MHz modulation bandwidth. Thus the output power density for the CPE subscriber terminal is 20 dBW/MHz or -40 dBW/Hz. This is less than the 23 dBW/MHz in Appendix B, § 21.1018 and greater than the -52 dBW/Hz specified for LMDS systems operating in the 27.5 GHz to 28.35 GHz band. Texas Instruments recommends that this level, (23 dBW/MHz or -37 dBW/Hz) apply to CPEs operating from subscriber locations with return links.

Finally, Texas Instruments urges the Commission to avoid the imposition of regulatory structures which will delay or disadvantage LMDS service. In particular, Texas Instruments agrees with the Commission's tentative conclusion not to impose ownership restrictions on LMDS service. In Texas Instruments view, broad participation by a variety of industries and companies holds the best promise for the early introduction of LMDS service to the American people. In addition, Texas Instruments urges the Commission to allow and actively encourage the flexible use of spectrum in the 27.5 to 30.0 GHz band. Moreover, given the fact that licensees will have to pay for LMDS spectrum through competitive bidding. Texas Instruments believes that there will be no economic incentive to warehouse LMDS spectrum and that construction requirements are, therefore, unnecessary. Texas Instruments also believes that the proposed use of Basic Trading Areas (BTAs) is an appropriate compromise.

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Comments of Texas Instruments
on the
Third NPRM and Supplemental Tentative Decision

Texas Instruments Incorporated, ("Texas Instruments" or "TI") hereby submits the following comments in response to the Commission's Third Notice of Proposed Rule Making to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band, to Reallocate the 29.5 - 30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services ("Third Notice").

I. STATEMENT OF INTEREST

A. Texas Instruments - A Manufacturer of Digital LMDS Systems

Texas Instruments is a high technology company with major business segments of semiconductors, defense electronics, communication and electronics systems, software, material and controls, and personal productivity products. The company has participated at every stage of this proceeding.

Texas Instruments was an active participant in the Commission's 28 GHz Band Negotiated Rule Making Committee during the summer and early fall of 1994. The results of the Committee indicate that LMDS and FSS service uplinks were not technically able to reasonably share the same spectrum due to the ubiquitous satellite subscriber transceivers. However, analyses for co-sharing of the 28 GHz band were conducted by Texas Instruments and others that indicated that LMDS subscriber and hub equipment could operate in this band with the MSS feeder links which were earth station gateway terminals to the satellites. The only agreement reached during the Negotiated Rule Making Committee session was an agreement on technical parameters allowing LMDS hubs and MSS feeder links used for non-geostationary satellites to share the same spectrum. However, not all satellite interests agreed with the position taken by Motorola and Suite 12.

Texas Instruments has continued to be active in this proceeding for the 28 GHz band . Texas Instruments has provided comments and analysis in support of the FCC finding that the 40 GHz band is not suitable for LMDS systems due to the short range associated with 40 GHz systems. Texas Instruments has also provided substantial support

for the allocation of a minimum of 1 GHz of spectrum. Texas Instruments, on May 12, 1995, proposed a spectrum allocation plan for the 28 GHz band. This proposal was also supported by Boeing, Hughes, Hewlett Packard, Lockheed-Martin, and Teledesic Corporation. The Third Notice band segmentation plan although different from the one previously submitted provides a basis for LMDS to go forward provided the 29.1 GHz to 29.25 GHz spectrum can be fully utilized by LMDS in a co-primary manner with the MSS feeder links such that the required 1 GHz of spectrum allocated to LMDS is fully available.

B. The Promise and Capability of LMDS

The Texas Instruments LMDS vision is one of a 28 GHz Local Multipoint Distribution Service that is based on a digital state of the art transmission technology that will enable near term, relatively inexpensive delivery of multichannel two-way video, telephony and other broadband digital information services to homes, businesses and schools. The Texas Instruments LMDS system is a two-way digital system consisting of hubs, customer premise equipment and central office servers providing video, data and telephony services. The Texas Instruments system is designed to operate using 1 GHz of non-contiguous spectrum. The down-stream portion of the LMDS system will carry the majority of the two-way traffic and would efficiently use the 27.5 GHz to 28.35 GHz frequency spectrum for delivery of service from the LMDS hubs (Nodes) to the subscriber terminals. The up-stream return link from the CPEs to the Nodes in the 150 MHz, 29.1 GHz to 29.25 GHz band is well suited to support the anticipated up-stream return traffic density and permit low cost CPEs. This LMDS band plan eliminates costly CPE

diplexers/filters and the need to use any of the allocated spectrum, a very valuable LMDS system element, as a guard band between transmit and receive signals.

The Texas Instruments LMDS system is based on a cellular design with a typical cell size of 5 km capable of serving up to 16,000 subscriber locations using four sector antennas at the hub. The system is capable of supporting up to 800 (3200 per node) simultaneous two-way voice channels and 150 to 200 video channels per hub sector. Power control at both the LMDS hubs and CPEs is used to facilitate system operation and to compensate for attenuation due to rain.

C. LMDS System Description

The central office facility houses the LMDS system video and telephony servers along with the system control and monitor console. The central office facility is connected to the LMDS system hubs via a wideband fiber optic cable or point-to-point microwave link. The LMDS system hubs, transmitting in the 27.5 GHz to 28.35 GHz band and receiving in the 29.1 GHz to 29.25 GHz band, are comprised of sector antennas (up to four quadrants), transmit/receive microwave equipment, frequency synthesizers, digital modulators and demodulators. Video and telephony support subsystems along with control, monitor and maintenance equipment also are housed at the hubs. Each subscriber location will have a CPE that employs a directional antenna , a down-converter and demodulator to support the video channels, 64 kbps or 1.2 Mbps data ports and a minimum of two telephone lines. A solid-state 20 mW transmitter, operating in the 29.1 GHz and 29.25 MHz band, and a digital modulator is used to support the subscriber return link to the hub.

II. QUICK RESOLUTION OF THE REMAINING ISSUES IN THIS DOCKET BY THE COMMISSION IS CRITICAL TO BRINGING THE BENEFITS OF LMDS TO THE AMERICAN PEOPLE

A. 28 GHz Proceedings History

Texas Instruments submits that most of the technical and regulatory issues in this proceeding have been thoroughly analyzed and considered and urges the Commission to proceed with the expeditious resolution of all remaining issues. The First Notice of Proposed Rule Making was released more than two and a half years ago.[1] At that time the Commission concluded that redesignation of the fixed point-to-point use of the band to fixed point-to-multipoint would stimulate greater use of the 27.5 GHz to 29.5 GHz frequency band and, based on petitions the Commission had received, proposed the allocation of two 1000 MHz blocks of spectrum for LMDS. The Commission proposed detailed rules for implementation of a Local Multipoint Distribution Service but did not specify what type of service would have to be offered. In response to the First Notice of Proposed Rule Making a number of different uses were proposed for terrestrial and satellite licensing.

The Second Notice of Proposed Rule Making was released on February 14, 1994.[2] The majority of the commentators supported the widespread interest in the point-to-multipoint uses of the 28 GHz band, but significant interest was also expressed by the satellite industry. In response to these competing demands for spectrum the Commission then established the LMDS/FSS 28 GHz Band Negotiated Rule Making Committee

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[1] Notice of Proposed Rulemaking, 8 FCC Rcd 557 (1993).
[2] Second Notice of Proposed Rulemaking, 9 FCC Rcd 1391 (1994).

(NRMC), which met between July 26, 1994, and September 23, 1994. The Report of the Committee which included the technical analysis provided to the committee by the working groups and others was presented to the Commission September 23, 1994. The results of the Committee's effort indicated that LMDS and FSS uplinks are not able to share the same spectrum due to the ubiquitous subscriber earth stations. However, there was indication that limited sharing could be achieved between FSS gateway earth stations and LMDS. Also, there were analyses that indicated that LMDS systems could be operated in such a manner to co-exist with MSS feeder link satellites, (NRMC 46).

Texas Instruments has since provided comments and analysis to show that LMDS is not viable at 40 GHz due to the short range associated with rain attenuation at 40 GHz. On May 12, 1995, Texas Instruments and others proposed a spectrum allocation plan for the 28 GHz band which would allow both LMDS and satellite proponents to share the 28 GHz band. The Third Notice offers a band segmentation plan and provides the basis for resolution of the 28 GHz allocation utilization issue. The proceedings for resolution of the 28 GHz band has taken three years. Resolution of the 28 GHz issues should be completed this year in order for the United States to maintain its leadership in broadband wireless deployment in the global market and allow an LMDS infrastructure to be developed with American manufacturers and providers of broadband wireless services.

B. Key Technical Issues

1. LMDS/MSS-Feeder Links Sharing 29.1 GHz - 29.25 GHz

LMDS is designated as primary in the 29.1 GHz - 29.25 GHz frequency segment along with MSS feeder links. However, in Appendix B § 21.1019 of the Third NPRM, LMDS Subscriber Transmission LMDS licensees are not allowed to operate transmitters

from subscriber locations in the 29.1 GHz - 29.25 GHz band. This rules out the possible use of this spectrum for subscriber return links to the LMDS hubs and is counter to the assignment of LMDS as primary in this segment. This limits the Commission's plan to support two-way LMDS services. Using part of the 27.5 GHz - 28.35 GHz spectrum for return links would require that a 120 MHz guardband be implemented in this 850 MHz, leaving only 730 MHz of useful spectrum for LMDS down and up links. This is far short of the minimum 1 GHz of spectrum needed for wideband services to compete against other wideband transport systems in the telecommunications market place. In addition to requiring a 120 MHz guardband, an expensive diplexer ($70 to $100) would be required in the subscriber equipment to implement the return link. If there were fifteen to thirty million subscribers in the United States this would be a $1.5 to $3.0 billion impact to the American public with a reduced service capability due to the guardband of 120 MHz and the loss of effective use of the 150 MHz in the 29.1 GHz to 29.25 GHz band.

Texas Instruments proposes that both LMDS and MSS feeder links can share this spectrum if the licensees cooperate fully and operate their systems in a manner that promotes sharing of the spectrum. Sharing of the 29.1 GHz -29.25 GHz spectrum can be facilitated by the following items.

a. Licensees of MSS feeder links and LMDS systems with 29.1 GHz - 29.25 GHz return links are required to coordinate using analysis of each system that supports the ability of each to operate without interference to the other service.

b. MSS feeder link antennas maintain a minimum of 45 dB sidelobes and use a minimum elevation angle of 10 degrees.

c. MSS satellites use higher gain, narrower beam (smaller footprint) antenna and/or spot beam antennas for reception.

d. MSS feeder links be located outside the areas covered by the top 8 MSAs, ranked by population, as defined by the Office of Management and Budget as of June 1993, using estimated population as of December 1992. In addition limit MSS uplinks in the 29.1 GHz- 29.25 GHz band to eight feeder link earth station complexes and provide a minimum separation from LMDS systems to prevent interference into LMDS hubs.

e. MSS feeder link systems use power control to facilitate their operation to maintain both C/N and C/I ratios.

f. LMDS systems use active power control to minimize the radiated power in the 29.1 GHz - 29.25 GHz band.

g. LMDS subscriber equipment be implemented with transmitter interlocks such that the antenna mounting structure is vertical (within 5 degrees) and are receiving an enabling signal from the hub before enabling the CPE return link transmit function.

h. CPE transmitter power be not more than 100 milliwatts, antenna gains to be less than 36 dB, antenna beamwidths to be between 2 to 5 degrees and sidelobes to be greater than 22 dB.

It is suggested that coordination be required between MSS feeder link operators and LMDS system operators to facilitate the two systems design, operation and analysis to assure that the two systems are afforded the opportunity to share the 29.1 GHz to 29.25 GHz band.

2. BTA Boundary Coordination

Texas Instruments agrees with the Commission that standards only need to be adopted that will facilitate coordination between geographically adjacent LMDS systems where they share the spectrum. The coordination required between LMDS licensees is similar to that required in locating and operating LMDS hubs and CPEs within a BTA. The analysis of Appendix B, an analysis of mutual interference between LMDS systems along BTA boundaries, shows that the primary interference mitigation is provided by the proper location and operation of LMDS hubs along BTA boundaries. Hubs located at distances greater than 20 km from a BTA boundary do not affect LMDS operation in adjacent BTAs. Those hubs that are less than 20 km from the BTA boundaries should be coordinated with the adjacent LMDS system using the same frequency. If hubs are located on BTA boundaries but are operated in a manner to radiate only into their assigned BTA (radiating away from the boundary at which they are located), and if the next set of hubs for the BTA was located 5 km away from the BTA boundary with omni radiation characteristics, it is shown that antenna orthogonal polarization in the adjacent BTAs would improve the potential of interference by only 0.08%. Also, locating hubs no closer than 5 km from the BTA boundary, (with no hubs on the BTA boundary), such that the CPEs between the BTA boundary and hub are pointed away from the BTA boundary but towards the hub proves additional reduction (50 percent) to potential interference to the CPEs without regard to antenna polarization.

Thus, the location and radiation pattern direction of the LMDS hubs along the BTA boundary is the primary interference mitigation technique for BTA boundary coordination. It is recommended that the Commission require coordination between

adjacent BTAs for LMDS systems that have different licensees. LMDS signal polarization at the boundary of service areas, even though antenna polarization is not the dominant mitigation approach, will provide another degree of system engineering flexibility in minimizing potential interference at the service area boundaries if orthogonal polarization of signals were available.

3. Power Spectral Density Measurement: dBW/MHz versus dBW/Hz

The power spectral density of the proposed rule section § 21.107, Transmitter Power, is specified as dBW/Hz. In lieu of specifying the power spectral density in a 1 Hz bandwidth, Texas Instruments believes that, for LMDS, the power spectral density should be specified in a 1 MHz bandwidth; i.e., dBW/MHz. This would accommodate LMDS systems that use FM modulation since the J_0 Bessel component will be a non-zero discrete component. Also, systems similar to the Texas Instruments LMDS system, that make use of a pilot reference carrier along with digital modulation would be accommodated.

The Texas Instruments pilot carrier operates at a 100 milliwatt (-10 dBW) level. This signal is placed adjacent to one end of the 27.5 GHz - 28.35 GHz band with a 10 MHz guardband. This highly stable carrier is the only signal within this 20 MHz segment. However, if measured with a 1 Hz bandwidth, this highly stable single carrier would produce a -10 dBW measurement and would not meet the proposed rule of -52 dBW/Hz as currently specified. If averaged over a 20 MHz bandwidth then the average power for that 20 MHz bandwidth would be -83 dBW/Hz and for a 1 MHz bandwidth the average power would be -70 dBW/Hz. Including the effects of hub antenna gain (15 dB maximum for the Texas Instruments hubs) for EIRP results in an EIRP of +5 dBW if measured in a 1 Hz bandwidth or -68 dBW when averaged over a 20 MHz

bandwidth or -55 dBW/Hz when averaged over 1 MHz. Texas Instruments believes that it is not the intent and purpose of this requirement to exclude single carrier reference signals and recommends a modification to require the power of signals to be averaged over a 1 MHz or 20 MHz bandwidth when measured. Additional consideration of eliminating this requirement in favor of requiring coordination between adjacent BTAs with different licensees is also recommended.

III. TEXAS INSTRUMENTS GENERALLY SUPPORTS THE PROPOSED BAND SEGMENTATION PLAN - WITH ONE CAVEAT

A. LMDS Minimum Spectrum Requirements; One GHz of Useful Primary Spectrum; if 29.1 - 29.25 GHz is used for return links.

Texas Instruments supports the proposed band segmentation plan where LMDS is the primary service in the 27.5 GHz - 28.35 GHz segment and co-primary with the MSS feeder links in the 29.1 GHz to 29.25 GHz segment provided that actual co-primary operation of LMDS hubs and subscriber links with MSS feeder links can be accommodated. In the two prior notices of proposed rule making, 2000 MHz of spectrum was available for two LMDS providers. The Third Notice only contains 850 MHz and 150 MHz of spectrum in two separate segments. It is possible, and Texas Instruments believes it is necessary, to aggregate these two segments and still achieve 1000 MHz of spectrum for a single provider. This would support a fully competitive LMDS system if the 29.1 GHz to 29.25 GHz spectrum were allowed to be used for the upstream return link from the subscriber location. Texas Instruments believes that both LMDS and MSS feeder links can fully share the 29.1 GHz to 29.25 GHz frequency spectrum if the applicants cooperate fully, design their systems for sharing and operate them in a manner

to minimize potential interference. Thus, we recommend that the restriction of proposed rule section § 21.107 be removed in favor of coordination between the LMDS and MSS feeder link licensees.

To license more than one LMDS operator per market would fragment the limited proposed LMDS spectrum. The need for 1 GHz of spectrum to be competitive with other services such as cable TV could not be met if there were more than one LMDS operator per BTA/market. Issue of two licenses, one for the 850 MHz contiguous band of spectrum and one for the 150 MHz co-primary portion or issuing three licenses, two for 425 MHz and one for the 150 MHz co-primary segment, would be a competitive disadvantage in the major markets where cable TV service is offered with the capability of offering service over one GHz of bandwidth. Thus, Texas Instruments strongly requests that the Commission not fragment the LMDS frequency spectrum in the major markets but to facilitate the aggregation of the 850 MHz and 150 MHz spectrum.

B. Sharing is Possible

Texas Instruments proposes that both LMDS and MSS feeder links can fully share the 29.1 GHz to 29.25 GHz spectrum if the licensees cooperate and operate their systems in a manner that promotes sharing of the spectrum. A summary of the items that would promote sharing the spectrum detailed previously follows.

a. Analysis of the two systems using operating parameters that support sharing.

b. MSS feeder link antennas with 45 dB sidelobes and minimum elevation angle of 10 degrees for operation.

c. Smaller footprint antennas for satellite receiving antenna.

d. MSS feeder links located outside the top 8 MSAs.

e. MSS feeder link power control to maintain both C/N and C/I ratios for proper operation.

f. LMDS use of active power control in the 29.1 GHz to 29.25 GHz frequency segment.

g. LMDS subscriber equipment implemented with transmitter interlocks.

h. Subscriber CPE transmitter power maximum of 100 milliwatts, antenna gain less that 36 dB, antenna beamwidth of 2 to 5 degrees and sidelobes greater than 22 dB.

The analysis of Appendix A demonstrates that LMDS subscriber CPEs in a BTA can operate without exceeding the power spectral density that would protect the MSS feeder link satellite receivers from harmful interference.

C. Band Segmentation Merits

The band segmentation proposal, along with allowing LMDS subscriber CPEs to operate their return link transmission to the hubs in the 29.1 GHz to 29.25 GHz frequency segment, would ensure the rapid development of innovative communications service through facilitating the entry of both LMDS and satellite providers in the 28 GHz frequency spectrum. These services will include two-way video, teleconferencing, telemedicine, telecommuting, data services and global networks. Adoption of flexible requirements which allows sharing coordination in the 29.1 GHz to 29.25 GHz band would promote the efficient use of the limited amount of spectrum available and allow new technology to respond to market demand. The domestic and international services that will be offered in the 28 GHz band will advance U.S. leadership in telecommunications by allowing the development of the world's most advanced wideband

infrastructure. Thus, the band segmentation plan, while not providing everything requested by the 28 GHz proponents, offers the potential for a reasonable compromise with the potential for one GHz of spectrum for LMDS. Quick adoption, with the full use of 1 GHz for LMDS, and execution of the proposed auctions is fully supported by Texas Instruments.

IV. THE COMMISSION SHOULD ADOPT ONLY MINIMAL REGULATORY ENCUMBRANCES

As a general matter, Texas Instruments believes that the Commission should promulgate only those technical and other regulations necessary to ensure LMDS operation and to encourage flexible spectrum use and should not issue restrictions aimed at ownership, construction or similar areas. In Texas Instruments view, such pervasive and intrusive regulations can only serve to limit the development, particularly the early development, of LMDS as a viable service.

1. Licensing

Texas Instruments believes that a primary allocation of 1 GHz is required for LMDS to become a viable commercial service.[3] This assertion is based on studies which compare LMDS installation and operating costs to the cost of existing cable service. Texas Instruments has concluded that in most major service areas that have existing cable service a single LMDS operator will require a license for the entire 1 GHz in order to compete. If two or more LMDS operators were to serve a single area, the number of LMDS channels and the total LMDS subscription revenues would not increase, but each would have the same subscriber market base but installation cost would increase significantly. In those cases where LMDS service providers would not require 1 GHz of spectrum, such as might be the case in some small market areas, then disaggregation, as discussed in paragraph 80 of the Third NPRM, could be used to allow other uses of that spectrum.

Texas Instruments supports the FCC's tentative conclusion that there is, or soon will be competition in the multichannel video programming distribution (MVPD) market. LMDS providers will be forced to compete in the MVPD market with cable, DBS, MMDs, and multiprogram broadcast digital ATV. Thus, TI believes that it is unnecessary in the interest of competition to require more than one LMDS provider in each service area.

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[3] Texas Instruments has repeatedly made this point in ex parte filings this year to the Commission. See Texas Instruments ex parte filing dated May 12, 1995, "Further Comments of Texas Instruments, Inc CC Docket No. 92-297". This point had not been raised earlier because the Commission earlier had proposed to allocate 2 GHz to LMDS with 1 GHz available to each of two service providers.

2. Service Areas

Texas Instruments agrees with the Commission's tentative conclusion to license LMDS on a Basic Trading Area (BTA) basis. While other service areas may be viable, BTA licenses strike an appropriate regulatory balance between the need for economies of scale and the expectation that local and regional programming will develop on LMDS systems. Similarly, the use of BTAs will afford LMDS licensees significant flexibility in designing technical systems that will meet a variety of local and regional needs.

3. Technology

With LMDS, as with other new services, e.g., PCS and advanced television, the Commission is about to introduce a service that can be provided through highly flexible and functionally expandable technology. As described above in section I-C, Texas Instruments digital LMDS is capable of two-way digital video, digital data and telephony services. This flexibility allows the Texas Instruments system to be configured to make use of the spectrum in the most efficient means and to provide a number of different market offerings. Accordingly, Texas Instruments believes the Commission should adopt rules that not only permit, but actually encourage flexible use of the LMDS spectrum. Since Texas Instruments will not be an operator or provider of LMDS service, it has no comment on the specific type of regulation to be applied to providers or the particular services they provide. As a general comment, however, Texas Instruments recommends that minimal regulation in this area is necessary. For example, requiring tariff filings would be burdensome and likely would reduce the value of the spectrum.

4. Eligibility

Texas Instruments agrees with the Commission's tentative conclusion not to impose cross-ownership restrictions on LMDS.[4] In our view, such restrictions are not required by any statutory provision, are unnecessary in a new service like LMDS and would be counter-productive to the initial development of LMDS.

Texas Instruments fully agrees with the Commission's analysis that neither the Cable Act of 1984 nor the Cable Competition Act of 1992 requires that local exchange carriers, cable television companies or any other entity be barred from being an LMDS licensee. As to telcos, even assuming the continuing constitutional validity of the cable-telco cross-ownership rule,[5] the Commission has consistently interpreted the restriction to apply only to the provision of programming over a wired transmission path.

By its own terms, the statutory ban prohibits "any common carrier, subject in whole or in part to title II" of the Communications Act from providing "video programming" directly or indirectly to subscribers in the carrier's service area. As used in the Cable Act, "video programming" means programming comparable to that provided over broadcast television stations and associated, for purposes of the cable-telco ban, with the provision over a "cable system". See 47 U.S.C. § 613(b)(1). Cable system, in turn, is defined as a "facility, consisting of a set of closed transmission paths and associated signal

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[4] Notice at §§ 97-108. The Commission also tentatively concluded in its First NPRM that ownership restrictions should not be imposed on LMDS operators. See First Notice of Proposed Rulemaking at §§ 33-34.

[5] As the Commission is aware, the ban has been struck down by numerous federal courts. Additionally, the Commission has consistently called for the repeal of the prohibition.

generation, reception, and control equipment". 47 U.S.C. § 602(7). Accordingly, wireless delivery systems do not appear to be contemplated by the statutory ban.

Likewise, with regard to cable systems, the only arguably relevant statutory bans deal specifically with broadcast television and MMDS within a cable system's service area. 47 U.S.C. § 613(a)(1)-(2). The Act contains no other geographical or service restriction.

Moreover, Texas Instruments believes that no policy reasons justify a ban on the ownership of LMDS licenses. Beyond experimental operations, LMDS does not currently exist. In order to reach its potential, the service will require substantial investment of capital. Additionally, through the auction procedures contemplated by the Commission, LMDS operators, unlike broadcast television licensees, cable operators, MMDS licensees, DBS licensees, local exchange carriers and others providing potentially competitive services, undoubtedly will pay a large amount for the spectrum they use. In such an environment, LMDS will benefit by and prosper with the broadest possible participation by the largest number of potential licensees.

The belief that new services should not be burdened with ownership restrictions is supported, as the Commission notes, by the legislative history of the ownership restrictions contained in the Cable Act. As the Commission is aware, a potential cable-DBS cross ownership ban in one version of the bill was deleted at Conference. Congress concluded that it would be "premature" to adopt ownership restrictions "in view of the fact that there are no DBS systems operating in the United States at the time." Likewise, Texas Instruments believes that the Commission should not restrict the potential ownership of a service which does not yet exist.